## REMARKS

The following remarks are responsive to the Office Action mailed August 2, 2005.

Claims 1-14 are pending in the present application.

**Double Patenting Rejection:**

The Examiner has rejected Claim 1 of the present application under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-44 of co-owned US Patent Application 2004/0196297 (the '297 application). Although the conflicting claims are not identical, the Examiner finds that they are not patentably distinct from each other for the following reason.

As per Claim 1, the Examiner finds that the '297 application teaches inputting image data to be rendered on said display (transmission of pre-rendered data to the display); converting said image data from said first color space to image data of said second color space and subpixel rendering each individual color plane (ordered pre-subpixel rendered data set which may be converted back to conventionally ordered RGB color space to be displayed on an electronic display).

Currently, the Examiner finds that Claim 1 is broader than claims 1-44 of the '297 application. Additionally, the Examiner finds that Claims 2-14 of the present application are substantially similar to claims 1-44 of the '297 application.

As to the present double patenting rejection, Applicant respectfully traverses.

For the convenience of the Examiner, Applicant reproduces Claim 1 (as filed) of the '297 application below:

> "1. An image processing method comprising: subpixel rendering an image; storing the subpixel rendered image as a pre-subpixel rendered image; and transmitting the pre-subpixel rendered image for output to a display."

In addition, Applicant reproduces Claim 1, as currently amended in the '297 application below. Applicant is also submitting substantive Office Actions and Responses from the '297 application in an accompanying IDS for the Examiner's review:

> "1. A method for transmitting a first set of image data to an image rendering device, said first set of image data comprising a second set of image data and a third set of image data, wherein said second set of image data comprises image data that is not subpixel rendered and wherein said third set of image data comprises image data that is subpixel rendered, the steps of said method comprising:
>
> subpixel rendering image data to create said third set of image data;
>
> embedding said third set of image data with said second set of image data to comprise said first set of image data; and
>
> transmitting said first set of image data to said image rendering device."

The Examiner states that Claim 1 is broader than claims 1-44 of the '297 application. However, to Applicant's reading of claim 1 of the '297 application, there is no teaching of the steps of "inputting", "converting" and "subpixel rendering each individual color plane" involved in claim 1 of the '297 application.

Instead, the invention of the '297 application (and in claim 1 as amended) involves a method of pre-subpixel rendering an image and embedding the pre-subpixel rendered image into a image data set that is finally transmitted to a display. Such a subpixel rendering method could involve any known subpixel rendering technique and does not teach converting from three color image data to four color image data and subpixel rendering each individual color plane therein.

In addition, Claim 1 is now presently amended to include the limitation "sharpening the subpixel rendered image data with the luminance signal". Applicant respectfully submits that there is no such teaching or disclosure in the '297 application.

As no such teaching is evident in claims 1-44 of the '297 application, Applicant respectfully requests that the rejection under double patenting in view of the '297 application be removed.

**Claim Rejections:**

**35 USC 112:**

The Examiner rejects Claims 1-14 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Specifically, as to Claim 1, the Examiner finds the phrase "... display substantially comprising ..." to be indefinite.

As to currently amended Claim 1, Applicant avers that the present amendment moots the rejection.

As to Claim 12, the Examiner is "at a loss" to discern to what the phrase "...one of a group comprising ..." refers. The Examiner asks whether "a group" means the individual filters or whether it means the combination of the filters.

Applicant answers the Examiner's question but does not offer any amendment of Claim 12 because Applicant does not feel any amendment is necessary.

Applicant states that the phrase "one of a group, said group comprising..." means choosing one of the individual filters listed therein. In this manner, nothing more is intended than the use of a Markush group which is well known in the art of patenting.

**<u>35 USC 102:</u>**

<u>Claims 1-14:</u>

The Examiner rejects Claims 1-14 under 35 USC 102(e) as being anticipated by Murdoch (US PAP 2004/0263528).

Claim 1:

With regard to Claim 1, the Examiner finds that Murdoch teaches inputting image data to be rendered on said display (see for example paragraph [0060]); converting said image data from said first color space to image data of said second color space (see for example paragraph [0025]); for conversion from three color into four color; subpixel rendering each individual color plane (see for example paragraphs [0025] and [0060]).

As to Claim 1, Applicant respectfully traverses the present rejection.

For the convenience of the Examiner, Applicant reprints the cited paragraphs of Murdoch here:

> "[0025] The present invention is directed to a method for transforming three color input signals, bearing images or other data, to four or more color output signals for display on an additive display device having four or more color primaries. The present invention is useful, for example, for converting a standard 3-color RGB input color image signal to a four color signal for driving a four-color OLED display device having pixels made up of light emitting elements that each emit light of one of the four colors."

> "[0060] A process that may be used for resampling and transformation of the three color signal is shown in FIG. 5. The process receives 60 three color input signals in linear intensities. The sample format of the spatially sampled input signal is determined 62. Once the sample format is determined, it is determined 64 if the signals for the three color input signals are rendered for OLEDs that have different spatial locations. If the data has been rendered for

light emitting elements having different spatial locations, the optional step of resampling 66 the data to have three color information at each sampling location is then performed and may result in color values at each spatial position represented in the three color input signal, color values at each spatial position on the final display, or color values at other spatial locations The three color signal is then converted 68 to form four or more color signals using the method such as the one shown in FIG. 2 and discussed earlier. The four or more color output signals are then resampled 70 to the spatial pattern of the four or more color display device if this resampling was not completed in step 66. While these basic steps may be applied in any three to four or more color spatial interpolation process, the steps of determining the input signal and resampling the data may be accomplished through a number of methods that include various levels of complexity. Each of these steps will be elaborated further."

Claim 1 of the present application comprises as one of its limitations "subpixel rendering each individual color plane".

For merely one example, as noted in the present application for Figure 6, area resampling may be performed for each individual color plane at a time, as noted in the following passage below:

"[0060] In one embodiment, each input pixel image data may be mapped to two sub-pixels. In effecting this, there are still a number of different ways to align the input pixels and generate the area resampling filters. The first considered was to simply align 4 input pixels directly with the layouts shown in FIGS. 5A and 5B. FIG. 6 shows one example of an area resampling of the red color plane as described. Input pixel image data is depicted on grid 602 and the repeating group 604 of subpixels of FIG. 5A is superimposed upon the grid. Red subpixels 606 and 610 and their associated "diamond" filters 608 and 612 are

also shown. Area resampling may then occur in the manner described herein and in many applications incorporated herein, an example is given here: [...]"

By contrast, Applicant – giving a fair reading to the cited passages of Murdoch above – respectfully avers that there is no teaching, disclosure or suggestion to perform subpixel rendering to each individual color plane.

That said, however, Murdock does seem to give a synopsis of area resampling technique in the cited paragraphs below – which might be construed as subpixel rendering each individual color plane:

"[0072] Resampling Resampling may be performed either to resample data from a format intended for display on a prior art stripe or delta pattern as shown in FIG. 6a and FIG. 6b to a format with a color signal representing a value at every spatial location or it may be used to resample data from a format with a color signal at every spatial location to a pattern that includes a white subpixel, such as the stripe pattern shown in FIG. 8a or the quad pattern shown in FIG. 8b. As shown in each of these figures, the display device 110 is composed of pixels 112 having red 114, green 116, blue 118 and white 120 OLEDs.

[0073] **Various resampling techniques are known in the art and have been described by others including US Patent Application No. 2003/0034992A1, referenced above,** and Klompenhouwer, et al., Subpixel Image Scaling for Color Matrix Displays, SID 02 Digest, pp. 176-179. These techniques generally include the same basic steps. To perform resampling, a single color signal (e.g., red, green, blue, or white) is selected 130. The sampling grid (i.e., location of each sample) of the input signal is determined 132. The desired sampling grid 134 is then determined. A sample point corresponding to a

spatial location in a pixel is selected 136 in the desired sampling grid. If a sample does not exist in the input signal at this spatial location, neighboring input signal values in the color signal (i.e., either in the three color input signal or the four color output signal depending on when in the process resampling is applied) are located 138 in either one or two dimensions. A set of weighted fractions related to the spatial locations represented by the neighboring input signal values are then computed 140. These fractions may be computed by a number of means including determining the distance from the desired sample location to the neighboring samples in the input signal within each spatial dimension and summing these distances and dividing each distance by the sum of the distance from the selected sample point to the position of the neighboring samples in each dimension. The neighboring input signal values are then multiplied 142 by their respective weighted fractions to produce weighted input signal values. The resulting values are then added 144 together, resulting in the resampled data at the selected position in the desired sampling grid. This same process is repeated 146 for each grid position in the desired sampling grid and then for each color signal.

[0074] By performing the spatial resampling and color conversion as shown in FIG. 5, the resulting signal is not only converted from a three to a four or more color signal, the resulting signal is also converted from a three color signal with one assumed spatial sampling to a more than three color signal with a desired spatial sampling." (**Bold** emphasis added).

Applicant however notes that this disclosure teaches nothing more that what is taught in Applicant's co-owned US Patent Application No. 2003/0034992 – and further elaborated in Applicant's co-owned US Patent Application No. 2004/0051724.

To the extent, then, that the Examiner is employing Murdoch as a prior art reference, teaching the claim limitation of "subpixel rendering each individual color plane" -- then Applicant respectfully submits that the Murdoch is merely reiterating Applicant's own art. Therefore, Applicant believes that the Examiner should properly cite Applicant's art instead, if the Examiner cares to continue with the present rejection.

As to the current amendment to Claim 1, Claim 1 now comprises the further limitation "sharpening the subpixel rendered image data with the luminance signal". Applicant avers that this limitation is not taught, disclosed or suggested in any of the Applicant's co-owned applications – or in Murdoch.

Applicant notes that the Examiner, in reference to Claim 8, states that:

"Murdoch teaches sharpening at least one color plane with luminance data, cross color sharpening and self sharpening said chrominance data [–] see for example paragraphs [0043] for changes with respect to hue and [0076] for the color adjustment".

For the convenience of the Examiner, paragraphs [0043] and [0076] are reproduced below:

> "[0043] In any of these situations, **functions F2 and F3 may be designed to vary according to the color represented by the color input signals. For example, they may become steeper as the luminance increases or the color saturation decreases, or they may change with respect to the hue of the color input signal (R,G,B). There are many combinations of functions F2 and F3 that will provide color accuracy with different levels of utilization of**

**the additional primary with respect to the gamut-defining primaries. Additionally, combinations of functions F2 and F3 exist that allow a trade of color accuracy in favor of luminance.** Choice of these functions in the design or use of a display device will depend on its intended use and specifications. For example, a portable OLED display device benefits greatly in terms of power efficiency, and thus battery life, with maximum utilization of an additional primary having a higher power efficiency than one or more of the gamut defining primaries. Use of such a display with a digital camera or other imaging device demands color accuracy as well, and the method of the present invention provides both.

[0076] It is known in art to provide methods to compensate for aging or decay of OLED materials within an OLED display device. These methods provide a means for measuring or predicting the decay of OLED materials providing an estimate of the luminance of each primary or each primary within each pixel. When this information is available, this information may be used as an input to the calculation of relative luminance of the display. Alternately, in a display device having a method to determine aging, it can be desirable to adjust F1, F2, and F3 to reduce the reliance on the color primaries that are undergoing the most decay within the display device. **In a display device having red, green, blue and white color signals, adjustment of any or all of F1, F2 and F3 can be used to shift more luminance output to the red, green and blue primaries or to the white primary where lowering the luminance output of one of these groups of OLEDs slows the decay of the OLEDs used to produce a desired color.**" (**Bold** emphasis added).

To the extent Murdoch refers to luminance in the above cited paragraphs, the reference is made in connection with his functions F1, F2, and F3. Murdoch's Figure 2 details the calculation of his F1, F2, and F3 functions. Instead of using luminance to

"sharpen" the image data – as is required by the limitation of currently amended Claim 1 – Murdoch uses luminance in Figure 2 and in his F1, F2 and F3 function to perform "gamut mapping" -- that is, mapping image data from a set of three color primaries to a color space of four primaries (in Murdoch's case, RGB and W color space).

This is seen is the following passages from Murdoch:

"[0052] **Utilizing the present invention to transform three color input signals to more than four color output signals requires successive application of the method shown in FIG. 2.** Each successive application of **the method calculates the signal for one of the additional primaries**, and the order of calculation is determined by the inverse of a priority specified for the primary. For example, consider an OLED display device having the red, green, and blue primaries already discussed, having chromaticities (0.637, 0.3592), (0.2690, 0.6508), and (0.1441, 0.1885) respectively, plus two additional primaries, one slightly yellow having chromaticities (0.3405, 0.3530) and the other slightly blue having chromaticities (0.2980, 0.3105). The additional primaries will be referred to as yellow and light blue, respectively.

[0053] **Prioritizing the additional primaries may take into account luminance stability over time**, power efficiency, or other characteristics of the emitter. In this case, the yellow primary is more power efficient than the light blue primary, so the order of calculation proceeds with light blue first, then yellow. Once intensities for red, green, blue, and light blue have been calculated, one must be set aside to allow the method to transform the remaining three signals to four. The choice of the value to set aside may be arbitrary, but is best chosen to be the signal which was the source of the minimum calculated by function F1. If that signal was the green intensity, the method calculates the yellow intensity based on the red, blue, and light blue intensities. All five are brought together at the end: red, green, blue, light blue, and yellow intensities for display. A 3x5

phosphor matrix may be created to model their combination in the display device. **This technique may easily be expanded to calculate signals for any number of additional primaries starting from three input color signals."** (Bold emphasis added).

By contrast, the present invention uses luminance to "sharpen" the image data that has already been subpixel rendered or is being subpixel rendered.

As Claim 1 and the present invention utilizes luminance data in a different function, way and result that is not disclosed, taught or even suggested by Murdoch, Applicant respectfully requests the present rejection in view of Murdoch be removed.

Claims 2-8:

Without further argument to the specifics of the Examiner's rejection, Applicant notes that Claims 2-8 ultimately depend from allowable Claim 1 and are, therefore, allowable themselves.

Applicant respectfully requests that Claims 2-8 be passed through to allowance.

Claim 9:

As a threshold issue, Applicant noted that Claim 9 ultimately depends on allowable Claim 1 and is, therefore, allowable itself.

In addition, Applicant traverses the specific arguments and rejection of Claim 9 made by the Examiner. The Examiner finds that Murdoch teaches sharpening with a difference of Gaussian filter [—] see for example paragraph [0002].

For the convenience of the Examiner, Applicant reproduces paragraph [0002] below:

> "[0002] Additive color digital image display devices are well known and are based upon a variety of technologies such as cathode ray tubes, liquid crystal modulators, and solid-state light emitters such as Organic Light Emitting Diodes (OLEDs). In a common OLED color display device a pixel includes red, green, and blue colored OLEDs. These light emitting color primaries define a color gamut, and by additively combining the illumination from each of these three OLEDs, i.e. with the integrative capabilities of the human visual system, a wide variety of colors can be achieved. OLEDs may be used to generate color directly using organic materials that are doped to emit energy in desired portions of the electromagnetic spectrum, or alternatively, broadband emitting (apparently white) OLEDs may be attenuated with color filters to achieve red, green and blue."

Applicant respectfully submits that there is no discussion of the use of a "Difference of Gaussian" filter to perform sharpening of image data in paragraph [0002] above.

As Murdoch does not teach, disclose or suggest this limitation, Applicant respectfully requests that the present rejection be removed.

Claims 10-11:

With respect to Claims 10 and 11, Applicant notes that Claims 10 and 11 ultimately depend on allowable Claim 1 and are, therefore, allowable themselves.

In addition, Applicant avers that there is no teaching, disclosure or suggestion in Murdoch to cross-color sharpen or self sharpen image data.

Claims 12-14:

Without additional argument from Applicant with the specifics of the Examiner's findings involving Murdoch, Applicant merely notes that Claims 12-14 ultimately depends from allowable Claim 1 and are, therefore, allowable themselves. Applicant reserves the right to advance any further arguments for Claims 12-14 (and any other Claims) should the Examiner persist in maintaining the rejection in view of Murdoch.

Applicant respectfully requests that Claims 12-14 be passed through to allowance.

## Conclusion

In view of the foregoing amendments and remarks, Applicant respectfully submits that all pending Claims are patentable over the cited art of record and are in condition for allowance. Therefore, Applicant requests the Examiner to reconsider and withdraw the outstanding rejection and pass this application to allowance.

If the Examiner believes a telephone conference would expedite the allowance of the claims, the Examiner is invited to contact Stuart P. Kaler at (707) 824-2487.

Respectfully submitted,

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